Design and Technology Education: An International Journal

22.1

Visionary Expectations and Novice Designers – Prototyping in Design Education

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Abstract

In information design education, we strive to find methods that provide students with opportunities to explore different ways of learning and designing. We seek to support development of contextual competences that will be helpful in navigating an unknown future of design in society. A challenge in today's design education is to formulate and use methods that support design students in developing competencies in the space between basic form training and context-rich training. The aim of this study was to evaluate prototyping exercises in design education where the focus was in that in-between space.

The study is based on 33 prototyping workshops done between 2008 and 2015 and involving 160 students and two design teachers. Four different approaches to prototyping exercises are described, examined and evaluated: *spatial prototyping: multi-material prototyping, physical prototyping and a mix between the latter two. physical multi-material prototyping*.

The results show that the prototyping exercises did support the learning of diverse competencies in the in-between space of basic form training and context training. However, the exercises were also counterproductive and met with different kinds of resistance. The results of the study invite to a dialogue on how different prototyping techniques can stimulate learning in relation to future design competences.

Key words

design education, information design, prototyping, novice designer, bodily involvement, learning by experiencing

1. Introduction

The students applying to our BA program in Information Design-Spatial Design have difficulty in defining design and design competences; some referring to design as “styling”, “decorating” and “making things nice”, in their application letters. The students are not alone in thinking about design this way. In a panel discussion on design and innovation in Sweden 2015, a person in the audience asked the panel of design researchers:

> In the good old days, design was about aesthetics and function, but you are talking about relations, users and services. Have you forgotten about form and function?

The content of this question is central for this paper. Firstly, it points at how design is currently understood in parts of society. Judging from their statement of interest letters, sent by applicants in the last decade, the students admitted to the BA in Information Design could be described as a novice or even naïve designers. A novice designer follows the objective feature of a situation provided by an expert and tends to follow strict rules to deal with a problem. A naïve designer is a non-designer that has not systematically gained experience in the discipline in their everyday life (Dreyfus and Dreyfus 2005, Lawson and Dorst, 2009).

Secondly, the question points at the challenge in developing a design education curriculum and teaching design. We believe that form and function are important and that the repertoire of a designer has to include a wider range of competencies to meet future societal challenges. For instance, a policy in the field of design points to the role of design as creating a sustainable and democratic environment (SOU, 2015:88). With the greater scope for design in mind, the students need to be trained to deal with social issues in complex situations where design becomes a significant part of a whole. Information design education strives to support the students in becoming competent and expert and even prepare them to be visionary designers. That includes giving them the opportunity to learn how to be highly involved in the problem, respond to a situation intuitively, find new ways of doing things, redefine issues and be radically innovative (Dreyfus and Dreyfus 2005, Lawson and Dorst, 2009).

As design educators, we were considering how all those perspectives could be included in the intended course content when we planned the prototyping exercises presented and analysed here. Our goal in reporting our findings is to open a dialogue on if and how different prototyping techniques can stimulate learning in relation to future design competences.

2. Background

Information Design was established as an undergraduate educational subject in Sweden in 1988 because the regions’ manufacturing companies needed competent technical illustrators. Accordingly, the program has its roots in a context of great closeness to practice; spatial design and text design has grown from that initiative. During the past decade, the educational program has been revised to better meet national and international guidelines for academic studies in Sweden and in Europe. This has challenged information design education to develop design competencies of higher complexity.

Information design – spatial design as a subject involves basic knowledge that overlaps with that of, for example, interior design and architecture. As with many other educators in courses that have emerged recently in colleges and universities (see, for example, Visher and Poldma, 2003), we strive to identify and (re)formulate the substance of knowledge in design education. This effort has led us to try different exercises to enact a new curriculum. Thus the findings of this paper are not limited to information design but can also be of value for design education in general. It has been argued that subjective, elitist, ideological and master-apprentice models still control many architectural design education studios around the world (Salama 2015, p. 9). That model is said to promote invention over innovation, promote individualism and subjectivity over creative collaborative processes and community-based learning (ibid). We are obliged to provide students with an education that equips them with competencies necessary to work professionally with information, especially in spatial design, and to provide conditions for advanced studies at graduate level in information design (Study Plan for a BA in Information design, n.d.).

A challenge in information design education is that design is often seen as problem solving. Students being taught from this perspective are, for example, trained to make incremental improvements in different public spaces from an information design point of view. This view of the design process as a problem-solving improvement process is close to the Simon's (1970) definition. If spatial information designers are to design for the future, they need instead to be able to develop competencies for explorative innovation. To prepare the students for explorative radical innovation, we must enable them to develop competencies such as a culture of playfulness, permissiveness in groups, building on others' work, risk taking and radical questioning and understand the what, how and why of their role and the role of design in a future society (Peschl and Fundneider, 2014; Salama, 2015). Based on studies on designers in action, the design process can be described as radically transformational, involving the development of partial and interim solutions, which may ultimately play no role in the final design and lead to intrinsically discovering new goals (Caroll and Rosson, 1985). Education in information design needs to train the students to use their creativity to explore a problem space, rather than to solve problems. One goal then is to find methods to facilitate the 'voice' in learners and give students opportunities to talk and experience more than the teacher, as discussed in Ghassan and Bohemia (2015).

In striving to develop design education methods that combine relevance for society with opportunities for training in basic forms, we have explored different kinds of prototyping exercises. Previous research suggests that students value building prototypes more highly than doing other forms of representation (Lemons et al, 2010).

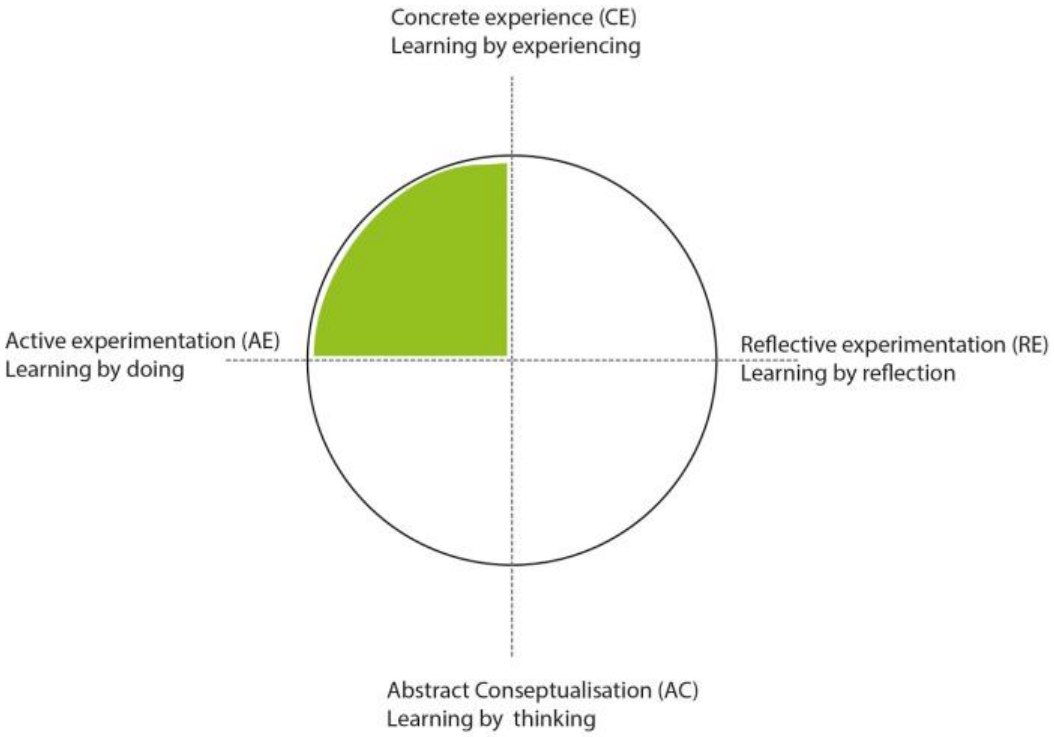

Figure 1. The learning cycle (adapted from Kolb and Fry, 1975 and Salama, 2015). The green field marks where the focus of the prototyping exercises presented in the paper can be placed in the learning cycle.

The prototyping exercises were intended to stimulate the students' active experimentation with basic training in volumes, composition and so on. They were also intended to contextualise the design scope and let students explore ideas by experiencing and experiment with materials (Figure 1). A novice designer depends heavily on a rule-based approach to producing designs, but the designs may fail because they are out of context (Lawson and Dorst, 2009:84). In the prototyping exercises, we aimed to create rich pedagogical situations for context training.

3. Method

We analysed four prototyping exercises done by students between 2008 and 2015. The examples are chosen to cover the diversity in the exercises.

Two design teachers did 33 lectures on prototyping exercises for 160 students. The students had all passed one semester or more of their BA in Information Design before the exercises were introduced. Most of the students had prior knowledge of design from college but limited experience in the basics of the craft of design.

Between 15 and 22 students participated in each of the exercise; the majority were female, and most between 20 and 30 years of age. The material we based the analysis on was observations, student presentations, course evaluations, discussions with the students, and photos from the

processes and of the prototypes. In examples 2 and 4, the students also wrote reflections on the design process. The reflections were analysed, noting any reflections about the prototyping exercises. All the material was analysed from the perspective of how the students experienced the exercises and how they made sense of them. Special attention was paid to what the students said about the experience, how they involved themselves in the exercises, and the limitations and the opportunities pointed out by the students. We use fictitious names in the article when referring to the students' written reflections.

To better organize the data collection in the courses where reflections were not systematically gathered, it would have been beneficial to use standardised protocol for the students as in Salama (2015). This would have both provided the students with an opportunity to reflect over their action and given us deeper insight into the way the students reflected. To have more data on the students´ reflection, we might, for example, have use verbal protocol analysis (VPA) as in Lemons et al. (2010), where the students were asked to think out loud when prototyping. It has to be said, though, that visualisation and talking are interlaced skills for a designer, which might make VPA a less suitable for explore prototyping in groups in design education (Lawson and Dorst, 2009).

4. Result

The four examples of prototyping exercises can be placed in the field between active experimentation and concrete experience. This section firstly presents the objectives of the prototyping exercises, secondly shows how those objectives were enacted and thirdly how the students experienced the exercises.

4.1 Spatial prototype

In this exercise, the students were to create spatial features in existing public spaces using masking tape and linerboard. In spatial design, analogue or digital scale models are frequently used to create an understanding of a three-dimensional environment. The models can be used as prototypes in the students' own processes, but also as a complement to sketches, drawings and photos to communicate different ideas. They, for example, help students understand the principles of volume and proportions and so develop their ability to define and bring together different spatial components into a (spatial) whole.

The aim of the masking taping exercise was let the students explore, experience, and discuss spatial issues and highlight spatial functions. To gain a bodily understanding of spatial relationships, the students need to explore and relate to a place on the scale of 1: 1.

In this 30 minutes' exercise, 20 students were divided into groups of three to four, and each group was given 150 metres of masking tape and some rolls of linerboard (Figure 2).

Figure 2. Spatial taping outside the university library. The actual location was a starting point for a project in cooperation with the Campus Department.

The students explored the social aspects of space and new ways of thinking about information and spatial design. Their temporary designs gave them opportunities to discuss how a spatial boundary could control movements, show directions and create spaces. This became especially evident because the students' own bodies could be involved. We could see that the students took on the task with great dedication and within the limited time frame. The students researched numerous aspects and were immersed in the activity. They examined the physical boundaries of spatial units and took decisions on where the boundaries could be placed and tested. They experimented with whether and how they could stop people from going through the premises and the consequences. They investigated the effect and experience of different spatial boundaries and their own understandings of a place.

From a design teacher's perspective, it is advantageous to sometimes use simple materials that are not associated with ready-made solutions. The materials' impermanence, in this case, the masking tape, provides opportunities to discuss how the perception of the space was affected by the taping.

4.2 Multi-material prototyping

In the *multiple material prototyping* exercise, the students did two different of rapid prototyping exercises, using a large amount of scrap material.

In the first exercise, the students were to prototype future places for ideas and innovation in municipal administration. In order to have the students question norms of how a workplace in a municipality could be designed, we chose, from a design education perspective, not to have the

students start the design process by studying existing office spaces. They started by defining the task based on the written reflections of innovation leaders working in different parts of the municipality. The students discussed the functions, spaces, experiences, movements, and visions put forward by the innovation leaders. Their task was then to create a new word from the reflections to sum up their discussions and make a prototype illustrating that word on the second day of the course.

The aim was to have them use a method in the early phase in the design process in which they were intrigued by users' stories and inspired to explore the spatial context. Additionally, the exercise was intended to have them not only talk about possible solutions and then execute them. The materials were chosen to help the students enter into dialogue with the material. The goal was in that handling and experimenting with the material would inspire to prototype innovative spatial designs that were new to the design of office spaces in municipality administration.

Figure 3. An early prototype of a future space in a municipal administration.

One group explored how they could support communication via several senses in a spatial environment. The students invented and prototyped the word sinuation, a combination of senses, sinu- ('*sinnen'* in Swedish) and -tion, from communication. Figure 3 shows their prototype, which according to the group was 'a form with glasses that represented different spatiality's and different senses' (Laura) and 'represented different words with different senses in focus' (Anna). They were able to construct something which one student identified as hanging 'bells', which, collaboratively led the group into new ideas of spaces, materials and users in relation to different senses. One element of this prototype that could be recognized four weeks later in their final design was the swinging pendulum movement.

While the method did contribute to the design process, as one of the students said, 'The prototype did not help me to a great extent; it was too early to develop our ideas in an object' (Laura).

Another group member said that prototyping promoted a common development and reduced misunderstandings, but that prototyping/brainstorming with these kinds of materials is just *seemingly* easy:

> The thing that is firstly perceived to be easy is in reality painful and full of distress. What I mean is that generating ideas and being creative in a certain amount of time creates anxiety. For me, it does not mean that the joy or will is not there; rather, that my suggestions do not always agree with my real opinion [...] The hard part for me is to come up with ideas that the group should think about. I think is the reason I get performance anxiety, and that I give ideas or opinions on the fly, without having processed them. (Anna)

Anna associated the exercise with anxiety. To share an interim idea that the student was not in full control of was painful and blocked her creative process.

The exercise, in combination with the reflection stories from innovation leaders, elicited reflection on the competence of a future designer:

> Can you manage to create new procedures and standards in a workplace that is quite structured and restricted? It could be that one must start with how the organization is structured to perhaps make changes in it, but so far, this is not yet our area of expertise as designers. (Lena)

In the second exercise, the students were to develop a prototype of a head-mounted projector (Figure 4). The workshop was a part of a larger research project in computer science (Kade et al, 2015). The purpose of the multi-material prototyping was to familiarize the students with different design methods as a general tool for use in design processes.

The materials were paper, empty packaging, objects of various sizes, such as recycled plastic, fabric, glass and metal. The students were also supposed to bring materials. They were to go from a sketch to a three-dimensional object, a “quick and dirty” prototype, in one day.

Most students appreciated the phase of idea generation, brainstorming and talking about different solutions based on a three-dimensional object but not, however, working with multi-material prototyping and sketching with temporary materials. Only one student brought some material. When we talked about why they did not bring materials, the students said they did not have access to any and could not afford buying any. As in the previous example of multi-material prototyping, the students explained that they would like to have progressed further in their process so the exercise would be meaningful. As this shows, the students could not see the rapid prototyping and quick and dirty exercises an important part of the design process and perceived the materials provided as debris.

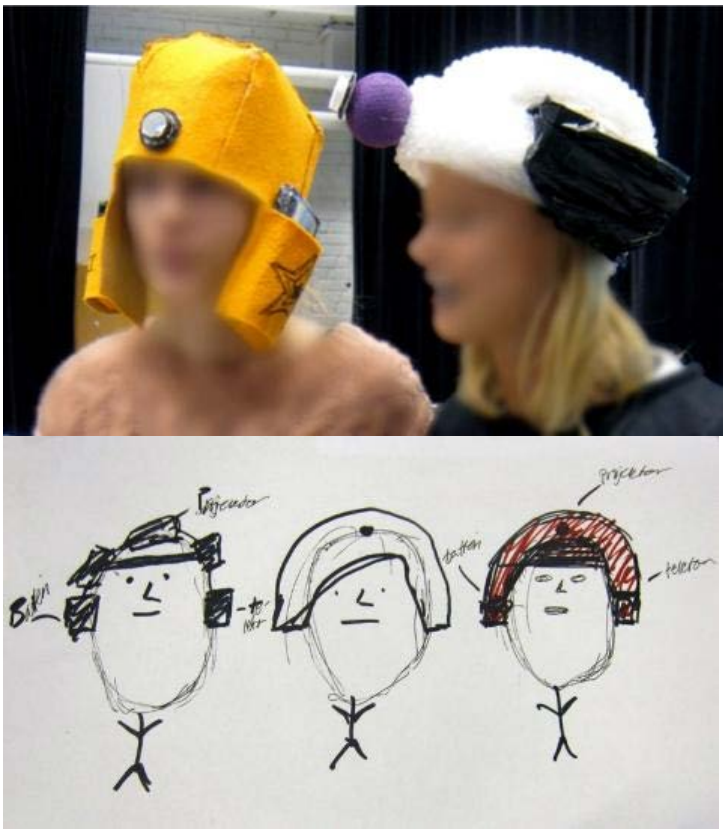

Figure 4. Student sketches and prototypes for head-mounted projector display. The two-dimensional sketches were the basis for the design of the three-dimensional prototypes in scale 1:1.

Some students expressed difficulty with choosing from the materials. Instead of feeling inspiration, they felt locked and inhibited. They would have welcomed a more limited range of materials. The aversion to the quick and dirty prototyping was not true of all the students though:

> The exercise that appealed to me the most was quick and dirty prototyping, which I thought was really fun. To rapidly produce something with the material you have available and get to work more with hands made my creativity flow more than when I only sat with pen and paper. The pressure fell away and it was easier to create freely. This, I believe, was because different materials can create different associations that make it easier for me to elaborate on or come up with new ideas than when I merely draw. I also thought it was very cool to see how many different prototypes we all had managed to do in such a short time. (Sarah)

The students' statements that they did not have access to material and could not afford to buy any indicate their difficulty in seeing the possibilities in using the free material around them. The limited interest in working with these kinds of materials pointed at the students' difficulty in letting the materials inspire them. They also had difficulties transforming materials or artefacts intended for other uses into something usable in prototyping. Yet, the results from the workshop were a wide range of unexpected design ideas and interesting outcomes for the prototypes of the head-mounted display.

4.3 Physical, multi-material prototyping

At the end of their first year, 20 students took part in a prototyping exercise to create five sound- and sensor-based stations in a county museum. The students were to add their stations to the standard exhibitions. Their task was to reflect on whether a particular part of the body seemed to be used more often and a part was underrepresented, when the visitors interacted with the exhibition. Therefore, the students were encouraged work with different materials to try, experience and build preliminary suggestions of ideas. One prototype explored how the visitor could enter into a human-shaped form to activate a story. The students played with the character of the material used (Figure 5). The student group quickly came up with an interesting concept and modified it one afternoon to make it accessible even for a visitor who was a child in a wheelchair. They used their bodies when prototyping, discussed inclusion and exclusion and tested the height and placement of the body form in order to exclude adults. They thought of the form as some kind of passage from current time to the past and the head and shoulders as what would activate sound.

Figure 5. Students exploring visitor involvement in a museum exhibition with physical prototypes. The students are exploring a way to enter into a human-shaped form to activate a sound.

Surprisingly, the students struggled to connect the raw prototype with something that could actually work in the museum. Even with supervision and supported discussion, the group had a hard time to see any value in the exploration of form in their first prototype and it seemed to be difficult for them to adjust their idea and take the form further. Although a design process does result in interim solutions that have no value in the final design (Caroll and Rosson 1985), the students did not see the form experiment as an asset in the design process. Their continued the process without reference to their initial form ideas. Instead of taking risks and experimenting and continuing the work by exploring different solutions with materials, bodies or form, they were stuck in the reflection phase. The final design in the museum exhibition was not consistent with the originality and aspects of the first prototype. The results point to the difficulties of developing from being a novice towards becoming an expert designer. A sign of that development occurs, for example, when students start to produce very interesting design suggestions, but cannot value them as good or interesting themselves and a conversation with the teacher might not help (Lawson and Dorst, 2009). In this case, the refection with the teacher did not give the students enough support to see the value in the new design. The students' final design prototype showed traces of students' having fallen back to a safer repertoire, that of the more rule-based novice designer.

The value of this prototyping exercise from an educational perspective was that it gave students an opportunity to reflect in action, try out various alternatives and involve their bodies into the design process. It also made the students come up with unexpected forms.

4.4 Physical prototyping

Another example of learning by experience was a physical prototyping exercise using the body. It was based on collaboration between the design educators and a choreographer to give students an opportunity to discover spaces with their own bodies (Figure 6).

Figure 6. During a workshop the students explored possibilities and limitations of a space using their bodies and sight, hearing, touch, and smell as tools in understanding the space.

One aspect of the design process that students often forgot is to imagine spatial changes depending on the number of people in a site. This exercise made the students aware of how various bodies and movements can change a place, and helped them incorporate that knowledge in their design processes and in their two and three-dimensional representations of place.

The choreographer's exercises had the students explore distance, direction, planes, levels, volumes and patterns. The students experienced concepts such as symmetry and asymmetry, using their bodies as tools for understanding basic shapes such as circles and squares. The exercises contained various formations in which the students related to each other's bodies as well as to spatial limitations.

The exercises were intended to support the students' awareness of the space and bodily experience in the design processes. One aim was to encourage the students to explore movement and different locations in the space as being significant for their perception and understanding of a place.

In their written reflections, the students described the prototyping as a different but useful way to understand a space. One student wrote that it was 'fun with the dance and movement workshop! You got a good idea of movement in space in different ways' (Linda). Another student described the experience of having a learning situation that included the body in an experimental way, as follows: '[t]he dance exercises in the room was a good way to do something other than a traditional lecture.' (Maria). A third student said that the combination of different learning approaches to grappling with spatial relationships was positive. The students appreciated the prototyping exercises that involved their bodies, as an alternative way of learning. However, from the teacher perspective, the link between the purpose of the workshop and information and spatial design could have been further clarified during the lectures.

4.5 Overview of the results

To sum up the results, the prototyping exercises evoked (at least) two different attitudes towards the exercises in the students. Table 1 presents the factors that distanced the students from the exercises and those that drew them in. The factors are based on the examples presented above.

Table 1. Factors that distanced the students from the exercises and that immersed them in the exercises

Distance	Immerse
Too early to transform ideas to objects	Materials' impermanence
Frustration in the contradiction between the seemingly simple material and the lack of skills to work with it in generating ideas	Material with functions other than modelling
Short time	Short time
No control over the ideas presented	Versatile materials
Performance anxiety	Less pressure

Prejudices about design and design process as stylish	Less misunderstandings in collaborative work
Not attractive	Used as a boundary object for discussion
See materials only as rubbish	Working with hands; using bodies, movements
Too much material	Common development; shared experience
Interim solutions and modifying not seen as an important part of the design process	Different materials creating different associations
No value to prototyping in the design process	Cool to see different prototypes made by others
Valuing talking over doing	Variation
Stuck in discussions	Having fun

5. Discussion

The prototyping exercises presented here offered students an opportunity to engage in learning by experience. They were also designed to support collaborative exploration of a design scope, questioning it, and exploration of how interaction of materials and the body could influence the design process and final design.

The exercises moved the focus from a teacher's critique and dominance in, for example, a feedback session towards the possibility of the students embodying, sharing and negotiating what they were doing, why and what for. They also allowed the students to define the design problem. These are all important areas in which to train a design student. It has to be noted though, that some of the students were more put off by the prototyping exercises than immersed in them. The results indicate that prototyping exercises, which were developed to support competencies in the in-between-space between basic form training, collaborative design processes, and skills that are relevant for the future, evoked resistance, aversion and withdrawal in some students. Simplified, the prototyping exercises brought out two different attitudes and reactions: 'aversion' and 'immersion' (Figure 7).

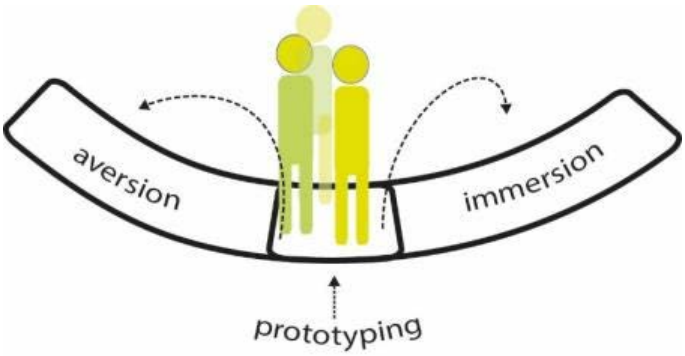

Figure 7. A simplified categorization of the students' attitudes and reactions towards the prototyping exercises (illustration J. Schaeffer).

Prototyping that evokes aversion might inhibit learning rather than support it. Judging from the way the students discussed design, it seems that their image of design was blocking the them from designing. They were not thinking of design in the extended role of architecture, as, for example, finding unexpected ways to provide a better way of living for individuals and societies (Salama, 2015); rather, they perceive design as stylish procedure.

On the other hand, when the students were immersed in the processes, the prototyping exercises supported learning, to a certain extent. The attitudes that led the students to become immersed in (see Table 1) were quite in line with the description of competencies important to creating a culture for exploratory innovation (Peschl and Fundneider, 2014). In a scale from aversion to immersion, the spatial prototyping and the physical prototyping generated more immersion than did the multi-material prototyping. To make the exercises meaningful for some students, it might be important to more explicitly connect the prototyping exercise to the other phases of the learning cycle (i.e. learning by reflection and learning by thinking) and to discuss the role of design and the design process. When the students withdrew from the exercises because they had no control over the result, or when they saw material only as unattractive garbage, the exercises did not create a culture for explorative innovation. In those cases, the students did not consider prototyping, using the with material creatively or releasing control to redefine the scope or the working methods as being important or even as a major aspect of designers' competence.

6. Conclusion

The study has examined the effects of five prototyping exercises involving the students in learning by doing and learning by experiencing in relation to future design competencies. We found that the prototyping exercises brought out two different attitudes and reactions in the students: aversion and immersion. The aversion reaction did not support learning in the time frame of the course.

The students showed clear signs of being novice designers, and the exercises did not meet them where they were (i.e. they asked for the rules for design and basic training). Since the intended goal of the prototyping exercises was in line with the skills to be developed in a designer who has reached a master or a visionary level (for example, a subtle sense of context, and exploring new domains and new trajectories for design) (Lawson and Dorst, 2009), one can say that they were less meaningful for the students since the prototyping put advanced expectations on novice designers.

To make the prototyping exercises meaningful for some of the students, one suggestion is to connect the exercise to other phases in the learning cycle (i.e. learning by reflection and learning by thinking) in a more explicit way.

As for design education, we see a challenge in finding methods to introduce exploration of design for possible futures. We are open to a dialogue on how different prototyping techniques can stimulate learning by doing and learning by experiencing in relation to future oriented design competences.

Acknowledgements

The authors would like to thank the students in Information Design that participated in our study and gave us permission to use their work as examples.

Note

An earlier version of this text was presented at the conference DRS 2016.

7. References

Carroll, John, M., and Rosson, Mary Beth (1985). 'Usability specifications as a tool in iterative development'. HR Hartson (Ed.), *Advances in Human-Computer Interaction*, pp. 1–28.

Ghassan, Aysar, and Bohemia, Erik (2015). 'Amplifying Learners' Voices through the Global Studio in Design Pedagogy-Developments in Art and Design Education'. In Tovey, Mike (ed). *Design pedagogy: Developments in art and design education*, Gower Publishing, New York.

Lawson, Bryan and Dorst, Kees (2009). Design expertise. Taylor & Francis, New York.

Lemons, Gay, Carberry, Adam, Swan, Chris, Jarvin, Linda and Rogers, Chris (2010). 'The benefits of model building in teaching engineering design'. *Design Studies*, 31(3), pp.288-309.

Kade, Daniel, Akşit, Kaan, Ürey, Hakan, and Özcan, Oguzhan (2015). 'Head-mounted mixed reality projection display for games production and entertainment'. *Personal and Ubiquitous Computing*, pp. 1-13.

Kolb, David and Fry, Ron (1975). 'Towards a Theory of Applied Experiental Learning'. *Theories of group processes*, John Wiley, Chichester.

Peschl, Marcus.F., & Fundneider, Thomas (2014). 'Designing and enabling interfaces for collaborative knowledge creation and innovation. From managing to enabling innovation as socio-epistemological technology'. *Computers and Human Behavior* 37, pp. 346–359.

Salama, Ashraf, M. (2015). Spatial design education: New directions for pedagogy in architecture and beyond. Ashgate Publishing, Ltd, Farnham, Surrey, United Kingdom

Simon, Herbert, A. (1970). *The sciences of the artificial*. M.I.T. Press, Cambridge, MA:.

Study Plan for a BA in Information design (n.d) Utbildningsplan för Informationsdesign Rumslig gestaltning (n.d) (in Swedish) https://www.mdh.se/utbildning/program/rumslig-gestaltning?programCode=DKE21 Retrieved the 2015-11-05

SOU 2015:88. *Gestaltad livsmiljö – en ny politik för arkitektur*, form och design (in Swedish) [Designed living environment : a new policy for architecture, form and design]. Stockolm: Elanders Swerige AB.

Visher, Jacqueline, and Poldma, Tiuu (2003). 'Growing a discipline: Evolving learning practices in interior design'. *IDEA Journal 4:173-184*

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